



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,547	01/15/2004	Timo Aila	032700-2	3047
22204	7590	12/19/2006		
NIXON PEABODY, LLP 401 9TH STREET, NW SUITE 900 WASHINGTON, DC 20004-2128			EXAMINER REPKO, JASON MICHAEL	
			ART UNIT 2628	PAPER NUMBER
			MAIL DATE 12/19/2006	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/757,547

Applicant(s)

AILA ET AL.

Examiner

Jason M. Repko

Art Unit

2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Parent claim 1 recites a “first visibility” test in line 4, and a “second visibility” test in line 10, and as such the “visibility test” recited in line 2 of claim 5 has two possible antecedent bases.

### *Claim Rejections - 35 USC § 101*

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claims 1-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**

5. Claims 1-8 appear to be to an abstract idea rather than a practical application of the idea. The claimed invention does not result in a physical transformation nor does the claimed invention appear to provide a useful, concrete and tangible result. Claims 1-8 are directed to a process that does nothing more than solve a mathematical problem and manipulate abstract ideas.

6. Annex 5 of the “Interim Guidelines for Examination of Patent Application for Patent Subject Matter Eligibility” provides guidance with respect to the determination of the patentability of mathematical algorithms. If the “acts” of a claimed process manipulate only

Art Unit: 2628

numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Benson, 409 U.S. at 71-72, 175 USPQ at 676. Thus, a process consisting solely of mathematical operations, i.e., converting one set of number into another set of numbers does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

7. Claims 1-8 are directed to a process consisting solely of operations manipulating a set of mathematical entities. The result of the operations is set numbers representing intensity values arranged as a two-dimensional array. It fails to use the result of "rasterizing visible primitives" to enable its functionality to be realized. Additionally, the asserted practical application in the specification of method for testing visibility is "displaying the rasterized visible primitives." The practical application is not recited in the claims nor does it flow inherently therefrom. Therefore, claims 1-8 are directed to non-statutory subject matter.

8. Claims 9-18 encompass a system comprising nothing more than software modules. Applicant is reminded that a computer that solely calculates a mathematical algorithm is non-statutory subject matter. Claims 9-18 are directed to a generic computing system performing a mathematical algorithm without a recited practical application. In effect, claims 9-18 seek to cover every substantial practical application of the abstract idea itself.

9. To expedite a complete examination of the instant application, the claims rejected under 35 U.S.C. 101 as non-statutory subject matter are further rejected as set forth below in anticipation of applicant amending the claims to place them within the four categories of invention.

***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. **Claims 1, 2, 4, 5, 7 and 8 rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,480,205 to Greene et al.**

12. With regard to claim 1, Greene et al discloses “a method for testing visibility of graphics primitives, said method comprising the steps of:

a. computing the geometry of graphics primitives (*lines 25-28 of column 7: "FIG. 1 illustrates a preferred embodiment of the present invention in which the numeral 100 identifies a graphics system for rendering geometric models represented by polygons. The graphics system includes a scene manager 110 which sends scene geometry to a geometric processor 120."*);

b. testing the visibility of the computed primitives in a first visibility test (*lines 13-17 of column 12: "Considering now the steps of procedure Process Batch of Boxes 700 (FIG. 7), in step 702, the scene manager 110 tests each box in the batch to see if it is occluded by the tip of the z-pyramid using procedure Is Box Occluded by Tip 1900, which will be discussed later."*);

c. storing occlusion data of the visible primitives for a next comparison based on said first visibility test (*lines 20-24 of column 12: "Using procedure Transform & Set Up*

Art Unit: 2628

*Polygon 900, the geometric processor 120 transforms each face to perspective space and performs the other geometric computations required to create the tiling record for the face, which is then output to the culling stage 130 (step 704).");*

d. computing the occlusion data for each visible primitive (*line 66 of column 13 through of line 1 of column 14: "Next, step 910 creates a tiling record for the polygon from the geometric information computed in the preceding steps and outputs this record to the culling stage 130.";*

e. collecting said primitives to an occlusion data buffer (*lines 7-9 of column 14: "Geometric information computed for a polygon by Transform & Set Up Polygon 900 is stored in a tiling record 5000 containing the following information.", wherein said occlusion data buffer stores primitives formed by at least three vertices (lines 49-50 of column 13: "First, step 902 transforms the polygon's vertices to perspective space."; Figure 14 shows a polygon with three vertices; lines 16-19 of column 14: "...3. number of edges ("n"); 4. coefficients  $(A_1, B_1, C_1)$ ,  $(A_2, B_2, C_2)$ , . . . ,  $(A_n, B_n, C_n)$  of edge equations (polygon has n edges); and 5. coefficients  $(A_p, B_p, C_p)$  of plane equation..."*);

f. testing the visibility of the collected primitives in a second visibility test with said computed occlusion data; and rasterizing visible primitives of the second visibility test (*lines 32-35 of column 17: "Next, step 1308 determines whether the plane of the polygon is occluded within the current cell. The polygon's plane equation, which is stored in the tiling record, has the form..."*; *lines 52-54 of column 12: "In step 720, the list of polygons associated with a visible box is rendered with procedure Render Polygon List 300."*; *lines 50-58 of column 9: "In step 304 of Render Polygon List 300, the culling*

*stage 130 processes these records using procedure Tile Polygon List 800, which tiles each polygon into the z-pyramid 170 and determines whether it is visible. For each visible polygon, the culling stage 130 sends the corresponding rendering record on to the z-buffer renderer 140, which renders the polygon into the output image 150 using conventional z-buffering (step 306).").*

13. One of ordinary skill in the art would recognize that the tiling record stores "primitives formed by at least three vertices" from lines 62-63 of column 13 (" Next, step 908 computes the equation of the plane of the polygon and the equation of each edge of the polygon.") in view of figure 14 showing a primitive with 3 vertices coupled with the fact that the tiling record stores information defining the polygon as shown in lines 16-19 of column 14. Greene et al states that a polygon can be defined by edge equations in lines 63-65 of column 1: "The memory system in this [example Pixel-Planes] architecture takes as input a polygon defined by its edge equations..."

14. With regard to claim 2, Greene et al discloses "the steps of discarding hidden primitives of the first visibility test" (lines 16-17 of column 12: "Occluded boxes are removed from the batch.").

15. With regard to claim 4, Greene et al discloses "after said first visibility test, collecting occlusion data of the visible primitives belonging to the frame to be rendered to the occlusion data buffer" (lines 17-24 of column 12: "Next, the scene manager 110 sends records for the front faces of each box in the batch to the geometric processor 120. Using procedure Transform & Set Up Polygon 900, the geometric processor 120 transforms each face to perspective space and performs the other geometric computations required to create the tiling record for the face,

Art Unit: 2628

*which is then output to the culling stage 130 (step 704)."). One of ordinary skill in the art would recognize the visible primitives belong to a frame to be rendered from lines 50-58 of column 9.*

16. With regard to claim 5, Greene et al discloses "wherein after said visibility test, collected a predefined amount of occlusion data of the primitives to the occlusion data buffer" (*lines 16-19 of column 14: "...3. number of edges ("n"); 4. coefficients  $(A_1, B_1, C_1)$ ,  $(A_2, B_2, C_2)$ , . . . ,  $(A_n, B_n, C_n)$  of edge equations (polygon has  $n$  edges); and 5. coefficients  $(A_p, B_p, C_p)$  of plane equation..."*).

One of ordinary skill in the art would recognize that the tiling record inherently establishes the predefined amount of occlusion data.

17. With regard to claim 7, Greene et al discloses "further comprising the step of testing visibility of an object before the geometry processor by a bounding volume method" (*line 67 of column 6 through line 1 of column 7: "The term bounding box, sometimes shortened to box, is applied to bounding volumes of any shape..."*; *lines 63-66 of column 11: "Within Process Batch of Boxes 700, the scene manager 110 culls boxes which are occluded by the "tip" of the z-pyramid and sends the remaining boxes to the geometric processor 120..."*).

18. With regard to claim 8, Greene et al discloses "the step of testing the visibility of the primitive in the first and the second visibility test with a low resolution Z-buffer" (*lines 63-66 of column 11 (emphasis added): "Within Process Batch of Boxes 700, the scene manager 110 culls boxes which are occluded by the "tip" of the z-pyramid and sends the remaining boxes to the geometric processor 120..."*; *lines 50-58 of column 9: "In step 304 of Render Polygon List 300, the culling stage 130 processes these records using procedure Tile Polygon List 800, which tiles each polygon into the z-pyramid 170 and determines whether it is visible. For each visible polygon, the culling stage 130 sends the corresponding rendering record on to the z-buffer*



Art Unit: 2628

*renderer 140, which renders the polygon into the output image 150 using conventional z-buffering (step 306)."). Greene et al defines a z-pyramid with levels analogous to a low resolution z-buffer in lines 56-62 of column 6:*

*A cell in the z-pyramid is the region of the screen corresponding to a value in the z-pyramid. Preferably, at the finest level of the z-pyramid, cells correspond to depth samples depths at pixels when point sampling and depths at subpixel samples when oversampling. At coarser levels of the z-pyramid, cells correspond to square regions of the screen, as with image pyramids in general.*

### ***Claim Rejections - 35 USC § 103***

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

21. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

Art Unit: 2628

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**22. Claims 3, 9-12 and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,480,205 to Greene et al in view of Gernot Schaufler, Julie Dorsey, Xavier Decoret, François X. Sillion, "Conservative Volumetric Visibility with Occluder Fusion," July 2000, Proceedings of the 27th Annual Conference On Computer Graphics and Interactive Techniques, p.229-238 (Schaufler et al).**

23. With regard to claim 9, Greene et al discloses "a system for testing visibility of graphics primitives, said system comprising:

- g. a geometry processor (*120 shown in Figure 1*);
- h. a z-buffer component (*180 shown in Figure 1*);
- i. a first visibility test module (*110 shown in Figure 1; lines 13-17 of column 12: "Considering now the steps of procedure Process Batch of Boxes 700 (FIG. 7), in step 702, the scene manager 110 tests each box in the batch to see if it is occluded by the tip of the z-pyramid using procedure Is Box Occluded by Tip 1900, which will be discussed later."*);
- j. a pixel processing means (*lines 50-58 of column 9: "In step 304 of Render Polygon List 300, the culling stage 130 processes these records using procedure Tile Polygon List 800, which tiles each polygon into the z-pyramid 170 and determines whether it is visible. For each visible polygon, the culling stage 130 sends the*

*corresponding rendering record on to the z-buffer renderer 140, which renders the polygon into the output image 150 using conventional z-buffering (step 306).";*

k. an occlusion data buffer, wherein said occlusion data buffer stores primitives formed by at least three vertices (*lines 7-9 of column 14: "Geometric information computed for a polygon by Transform & Set Up Polygon 900 is stored in a tiling record 5000 containing the following information.";* and

l. a second visibility test module (*lines 32-35 of column 17: "Next, step 1308 determines whether the plane of the polygon is occluded within the current cell. The polygon's plane equation, which is stored in the tiling record, has the form..."*; *lines 52-54 of column 12: "In step 720, the list of polygons associated with a visible box is rendered with procedure Render Polygon List 300. "*; *lines 50-58 of column 9).*

24. Greene et al does not expressly disclose "an occlusion fusion unit." Schaufler et al discloses using occlusion fusion in the sixth paragraph of section 1:

*We show that hidden regions of space are valid blockers and that any opaque blocker can be extended into such regions of space. This effectively combines — fuses [32] — one blocker with all the other blockers that have caused this region to be occluded and results in a dramatic improvement in the occlusions detected.*

25. With regard to claims 3 and 15, Schaufler et al discloses an "occlusion fusion cache" (*1<sup>st</sup> paragraph of section 4: "Our subdivisions of space are a quadtree in 2D and 2 1/2D, and an octree in 3D."*; *1<sup>st</sup> paragraph of section 4.5: "Occlusion of the original objects is determined by inserting their bounding boxes into the tree and checking that all the voxels they overlap are hidden."*). One of ordinary skill in the art would recognize that the memory storing the octree in

Art Unit: 2628

3D as disclosed by Schaufler is analogous to an occlusion fusion cache as the octree stores occlusion fusion information (*Figure 19 shows the memory requirements for an octree*).

26. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate an occlusion fusion unit and cache in the system disclosed by Greene et al. The motivation for doing so would have been to improve the computation performance of visibility determination as suggested by Schaufler et al in the Abstract (emphasis added): "We demonstrate the applicability to visibility preprocessing for real-time walkthroughs and to shadow-ray acceleration for extended light sources in ray tracing, with significant acceleration in both cases." Therefore, it would have been obvious to combine Greene et al with Schaufler to obtain the invention specified in claim 3, 9 and 15.

27. Claims 10, 11, 12 are 14 recite the limitations similar in scope to those of claims 2, 4, 5, and 7, respectively. The limitations recited claims 2, 4, 5, and 7 were shown to be met by the system disclosed by Greene et al. Therefore, claims 10, 11, 12 are 14 met by the combination of Greene et al and Schaufler et al, wherein Greene et al discloses the limitations recited in claims 10, 11, 12 are 14.

28. Claim 16 is met by the combination of Greene et al and Schaufler et al, wherein Greene et al discloses "the Z-buffer connected to the first visibility test module is a low resolution Z-buffer" (*lines 63-66 of column 11 (emphasis added): "Within Process Batch of Boxes 700, the scene manager 110 culls boxes which are occluded by the "tip" of the z-pyramid and sends the remaining boxes to the geometric processor 120..."*).

29. Claim 17 is met by the combination of Greene et al and Schaufler et al, wherein Greene et al discloses "a high resolution Z-buffer connected to said second visibility test" (*lines 33-39 of*

Art Unit: 2628

*column 7: " Both the culling stage 130 and the z-buffer renderer 140 have their own dedicated depth buffers, a z-pyramid 170 in the case of the culling stage 130 and a conventional z-buffer 180 in the case of the z-buffer renderer 140. Preferably, the z-buffer 180 and the finest level of the z-pyramid 170 have the same resolution and the same arrangement of image samples."*

30. With regard to claim 18, Greene et al discloses a low resolution Z-buffer as shown with respect to claim 16, and Greene et al discloses using bounding boxes to determine visibility lines 63-66 of column 11: "Within Process Batch of Boxes 700, the scene manager 110 culls boxes which are occluded by the "tip" of the z-pyramid and sends the remaining boxes to the geometric processor 120..."; however, Greene et al does not expressly disclose values stored to the low resolution Z-buffer are calculated in the occlusion fusion cache. Schaufler et al discloses using occlusion fusion (*sixth paragraph of section 1*) to resolve visibility (*1<sup>st</sup> paragraph of section 4.5*: "*Occlusion of the original objects is determined by inserting their bounding boxes into the tree and checking that all the voxels they overlap are hidden.*").

31. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to further modify the combination of Greene et al and Schaufler et al to utilize the occlusion fusion cache to calculate low resolution Z-values. The motivation for doing so would have been to improve the performance of visibility determination as suggested by Schaufler et al in the Abstract (emphasis added): "We demonstrate the applicability to visibility preprocessing for real-time walkthroughs and to shadow-ray acceleration for extended light sources in ray tracing, with significant acceleration in both cases." Therefore, it would have been obvious to combine Greene et al with the teachings of Schaufler et al to obtain the invention specified in claim 18.

Art Unit: 2628

**32. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,480,205 to Greene et al in view of U.S. Patent No. 6,720,964 to Fowler et al.**

33. With regard to claim 6, Greene et al discloses an "occlusion buffer" (*lines 7-9 of column 14: "Geometric information computed for a polygon by Transform & Set Up Polygon 900 is stored in a tiling record 5000 containing the following information."; lines 50-58 of column 9: "In step 304 of Render Polygon List 300, the culling stage 130 processes these records using procedure Tile Polygon List 800, which tiles each polygon into the z-pyramid 170 and determines whether it is visible."*), as well as the limitations recited in parent claim 1. Greene et al does not disclose compression. Fowler et al discloses compressing occlusion data (*lines 12-14 of column 4: "...the compression block 36 attempts to compress the Z data prior to storage in the Z buffer 40"*).

34. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate a step of compressing the occlusion data as taught by Fowler et al in the method and system disclosed by Greene et al. The motivation for doing so would have been to reduce the storage requirements for the occlusion data. Therefore, it would have been obvious to combine Greene et al with Fowler to obtain the invention specified in claim 6.

**35. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,480,205 to Greene et al in view of Gernot Schaufler, Julie Dorsey, Xavier Decoret, François X. Sillion, "Conservative Volumetric Visibility with Occluder Fusion," July 2000, Proceedings of the 27th Annual Conference on Computer Graphics and Interactive Techniques, p.229-238 (Schaufler et al) in view of U.S. Patent No. 6,720,964 to Fowler et al.**

Art Unit: 2628

36. With regard to claim 13, the combination of Greene et al and Schaufler et al disclose the limitations of parent claim 9. Furthermore, Greene et al discloses an "occlusion buffer" (*lines 7-9 of column 14: "Geometric information computed for a polygon by Transform & Set Up Polygon 900 is stored in a tiling record 5000 containing the following information."; lines 50-58 of column 9: "In step 304 of Render Polygon List 300, the culling stage 130 processes these records using procedure Tile Polygon List 800, which tiles each polygon into the z-pyramid 170 and determines whether it is visible."*). Greene et al does not disclose compression. Fowler et al discloses compressing occlusion data (*lines 12-14 of column 4: "...the compression block 36 attempts to compress the Z data prior to storage in the Z buffer 40"*).

37. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate a step of compressing the occlusion data as taught by Fowler et al in the method and system disclosed by the combination of Greene et al and Schaufler et al. The motivation for doing so would have been to reduce the storage requirements for the occlusion data. Therefore, it would have been obvious to further modify the combination of Greene et al and Schaufler et al with Fowler to obtain the invention specified in claim 13.

### ***Response to Arguments***

38. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

39. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent No. 5,579,454 to Billyard discloses storing primitives and multiple occlusion tests. U.S. Patent No. 6,246,415 to Grossman et al shows an occlusion culling system

Art Unit: 2628

and method that employs bounding boxes and occlusion buffers. U.S. Patent No. 6,525,726 to Xie et al discloses two visibility tests and storing occlusion data.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Repko whose telephone number is 571-272-8624. The examiner can normally be reached on Monday through Friday 8:30 am -5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on 571-272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMR

  
ULKA CHAUHAN  
SUPERVISORY PATENT EXAMINER